

Claim Listing:

1. (currently amended) A method for determining a state of a person in an image, comprising:
 automatically defining a region of interest in the image indicative of a predetermined feature of the person using an early vision cue, wherein the region of interest comprises less than ten percent of the image; and
 automatically finding the location of the predetermined feature in the defined region of interest using elastic bunch graph matching.
2. (previously presented) A method for determining the state of a person as defined in claim 1, wherein the step of defining the region of interest includes roughly locating the region of interest using the early vision cue and the step of finding the location of the predetermined feature commences at a rough location provided by the step of defining the region of interest.
3. (previously presented) A method for determining the state of a person as defined in claim 2, wherein the early vision cues includes at least one of stereovision, motion, color, convexity, topology, or structure.
4. (previously presented) A method for determining the state of a person as defined in claim 3, wherein stereovision is used to produce disparity histograms and silhouette images.
5. (previously presented) A method for determining the state of a person as defined in claim 1, wherein the step of defining the region of interest includes background suppression.

6. (previously presented) A method for determining the state of a person as defined in claim 1, wherein the predetermined feature is the person's face and the state of the person is described by node positions of facial elements.

7. (previously presented) A method for determining a state of a person as defined in claim 1, wherein the image is in a sequence of images and the location of the predetermined feature is tracked in a subsequent image.

8. (previously presented) A method for determining a state of a person as defined in claim 7, wherein an erroneous location of the predetermined feature is corrected based on a model of typical facial features.

9. (previously presented) A method for determining a state of a person as defined in claim 7, wherein the method further comprises reinitializing the tracking of the location of the predetermined feature based on a predicted location of the predetermined feature.

10. (previously presented) A method for determining a state of a person as defined in claim 9, wherein the reinitializing step is performed using bunch graph matching.

11. (previously presented) A method for determining a state of a person as defined in claim 7, wherein the method further comprises using the location of the predetermined feature for animating a graphical head model.

12. (previously presented) A method for determining a state of a person as defined in claim 1, wherein the state of the person determined by the method is the degree to which an eye is closed.

13. (currently amended) Apparatus for determining a state of a person in an image, comprising:

means for automatically defining a region of interest in the image indicative of a predetermined feature of the person using an early vision cue, wherein the region of interest comprises less than ten percent of the image; and

means for automatically finding the location of the predetermined feature in the defined region of interest using elastic bunch graph matching.

14. (previously presented) Apparatus for determining the state of a person as defined in claim 13, wherein the early vision cue includes at least one of stereovision, motion, color, convexity, topology, or structure.

15. (previously presented) Apparatus for determining the state of a person as defined in claim 14, wherein stereovision is used to produce disparity histograms and silhouette images.

16. (previously presented) Apparatus for determining the state of a person as defined in claim 13, wherein the predetermined feature is the person's face and the state of the person is described by node positions of facial elements.

17. (currently amended) Apparatus for determining a state of a person as defined in claim 13, wherein the state of the person determined by the apparatus is the degree to which an eye is closed.

18. (currently amended) A method for determining a state of a person in an image, comprising:

automatically defining a region of interest in the image indicative of a predetermined feature of the person using an early vision cue, wherein the region of interest comprises less than ten percent of the image; and

automatically finding the location of the predetermined feature in the defined region of interest using elastic graph matching.

19. (previously presented) A method for determining the state of a person as defined in claim 18, wherein the elastic graph matching uses a model graph having nodes associated with wavelet jets.

20. (currently amended) A method for determining the state of a person as defined in claim ~~19~~ 18, wherein the wavelet jets are based on Gabor wavelets.

21. (currently amended) Apparatus for determining a state of a person in an image, comprising:

means for automatically defining a region of interest in the image indicative of a predetermined feature of the person using an early vision cue, wherein the region of interest comprises less than ten percent of the image; and

means for automatically finding the location of the predetermined feature in the defined region of interest using elastic graph matching.

22. (previously presented) Apparatus for determining the state of a person as defined in claim 21, wherein the elastic graph matching uses a model graph having nodes associated with wavelet jets.

23. (currently amended) Apparatus for determining the state of a person as defined in claim 22 ~~21~~, wherein the wavelet jets are based on Gabor wavelets.

24. (currently amended) A method for determining a state of a person in an image, comprising:

automatically defining a region of interest in the image indicative of a predetermined feature of the person using an early vision cue, wherein the region of interest comprises less than ten percent of the image; and

automatically finding the location of the predetermined feature in the defined region of interest using wavelet jet matching.

25. (previously presented) A method for determining the state of a person as defined in claim 24, wherein the wavelet jet matching uses a wavelet jet based on Gabor wavelets.

26. (previously presented) Apparatus for determining a state of a person in an image, comprising:

means for automatically defining a region of interest in the image indicative of a predetermined feature of the person using an early vision cue, wherein the region of interest comprises less than ten percent of the image; and

means for automatically finding the location of the predetermined feature in the defined region of interest using wavelet jet matching.

27. (previously presented) Apparatus for determining the state of a person as defined in claim 26, wherein the wavelet jet matching uses a wavelet jet based on Gabor wavelets.

28. (new) A method for determining a state of a person in an image, comprising:
automatically defining a region of interest in the image indicative of a predetermined feature of the person using an early vision cue consisting of stereovision; and
automatically finding the location of the predetermined feature in the defined region of interest using elastic bunch graph matching.

29. (new) A method for determining a state of a person in an image, comprising:
automatically defining a region of interest in the image indicative of a predetermined feature of the person using an early vision cue consisting of motion; and
automatically finding the location of the predetermined feature in the defined region of interest using elastic bunch graph matching.

30. (new) A method for determining a state of a person in an image, comprising:
automatically defining a region of interest in the image indicative of a predetermined feature of the person using an early vision cue consisting of color; and
automatically finding the location of the predetermined feature in the defined region of interest using elastic bunch graph matching.

31. (new) A method for determining a state of a person in an image, comprising:
automatically defining a region of interest in the image indicative of a predetermined feature of the person using an early vision cue consisting of convexity; and
automatically finding the location of the predetermined feature in the defined region of interest using elastic bunch graph matching.

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32. (new) A method for determining a state of a person in an image, comprising:
automatically defining a region of interest in the image indicative of a predetermined
feature of the person using an early vision cue consisting of topology; and
automatically finding the location of the predetermined feature in the defined region of
interest using elastic bunch graph matching.